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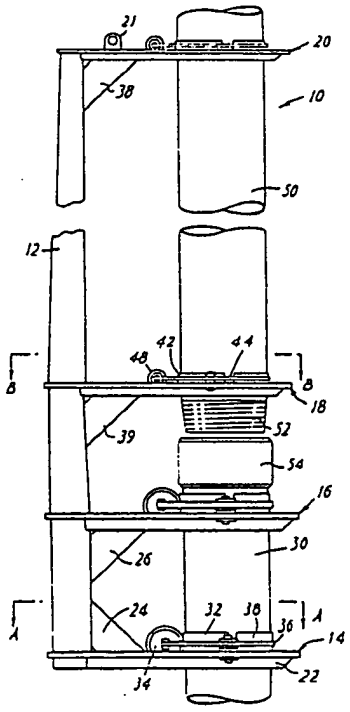
(54) Title: IMPROVEMENTS IN AND RELATING TO CASING STABBING TOOLS

(57) Abstract

A casing stabbing tool (10) for facilitating screwing onto the uppermost downhole joint (30) of a casing string the next joint (50) comprises an upstanding frame (12) having mounted thereon lower clamping means (14, 16) for clamping the tool to the joint (30) and upper clamping means (18) for embracing the joint (50). Further clamping means (20) ensure alignment of the suspended joint (50) while it is being screwed on. The height of the lower clamping means may be adjustable by an actuating mechanism and the clamping jaws provided with vertical rollers which support the joint while allowing its rotation. A wire pulley mechanism may be housed within the frame (12) for positioning the tool (10).



Improvements in and relating to casing stabbing tools

This invention relates to casing stabbing tools for use when a further casing joint (or section) of a string of steel casing joints lining a bore hole is being screwed to the uppermost joint of the string; and to drive mechanisms for positioning a structure at a desired position between two points.

In the Specification of U.S. Patent No. 4,295,527 there is described a casing stabbing tool comprising lower clamping means which are, in use, clamped around a projecting top of the uppermost downhole joint of a casing string and support an upright member on which is mounted a pair of claws for embracing and centering the next joint to be added to the string to facilitate stabbing and screwing it to the last downhole joint. While this tool greatly facilitates the connection of a new joint as compared with prior art procedures, the use of only one pair of claws for embracing the upper joint still required that the male thread of the new casing joint had, initially, to be guided manually into the female thread of the lower casing joint before exact alignment of the joints was effected by closing the upper claws about the new joint. This disadvantage is overcome according to the present invention by the use of one or more further pairs of claws to embrace the new joint to be connected.

According to a first aspect of the present invention there is provided a casing stabbing tool for facilitating screwing onto the upper threaded end of the uppermost downhole joint of a casing string the lower threaded end of a next joint to be added to the string, the tool comprising an upstanding frame having mounted thereon lower clamping means for rigidly clamping the tool to the

downhole joint and upper clamping means for embracing said next joint adjacent the lower end thereof, characterised in that the tool additionally comprises further upper clamping means for embracing said next joint at a higher point along the length thereof, the upper clamping means being operable to ensure alignment of said next joint when suspended above said downhole joint but permitting axial and rotational movement of said next joint so that it may be lowered and rotated to make up the threaded connection between the two joints.

During the use of the casing stabbing tool according to the first aspect of the present invention the upper casing joint must be suspended by the rig's lifting equipment for the whole period until the threaded connection to the lower casing has been made, requiring that the lower male thread of the upper joint has to be lowered into the female thread of the lower joint by means of the lifting equipment. However, the equipment is not designed for such very delicate manipulation, and usually the complete weight of the upper joint is taken by the threads before, and during, make-up of the threaded connection. The weight, which can be as much as 3,500 lbs, borne by the threads before they are screwed completely together can cause difficulties due for example, to increased friction, and even damage to the threads during lowering of the upper joint and making-up the connection.

According to a second aspect of the present invention there is provided a casing stabbing tool for facilitating screwing onto the upper threaded end of the uppermost downhole joint of a casing string the lower threaded end of a next joint to be added to the string, the tool comprising an upstanding frame having mounted thereon lower clamping means for rigidly clamping the tool to the

downhole joint, and upper clamping means for engaging said next joint, characterised in that the upper clamping means are arranged to permit only relative rotational movement of said next joint, and in that said tool additionally comprises actuating means for moving said upper clamping means axially with respect to said lower clamping means, whereby said next joint may be partly or completely supported during stabbing and make-up.

Preferably the upper clamping means comprises a number of circumferentially arranged rollers having a surface with a high co-efficient of friction and which engage said next joint and engage it axially, while allowing it to rotate during make-up of the threaded connection.

Desirably the upper clamping means additionally comprise location means, for example a pair of claws, which are arranged to embrace the joint to ensure its axial alignment while permitting relative axial and rotational movement; or further rotation-permitting clamping means and actuating means as described above.

Heavy tools, such as casing stabbing tools according to the present invention, which are freely suspended from the derrick of a floating drilling rig by a wire line tend to swing about due to wind forces and pitching, rolling and yawing movement of the rig, and require considerable manual strength for lateral manipulation from the rig floor. The suspended tool is thus difficult and dangerous to handle.

According to a third aspect of the present invention there is provided a drive mechanism for positioning a structure at a desired position between first and second points, the mechanism comprising a pulley housing having

first and second sheaves and a fixed sheave mounted thereon, situated between said lead sheaves and fixed sheaves a travelling block having first and second sheaves and being arranged for reciprocal movement, drive means for driving the travelling block relatively to the housing, a first line having one end secured to said housing and running over the first sheave on the travelling block and the first lead sheave to the first fixed point, and a second line secured to said housing and running round the second travelling sheave and the fixed turning sheave and over said second lead sheave to said second fixed point, the arrangement being such that operation of the drive means in one direction to cause movement of the travelling block away from said lead sheaves and towards the fixed block shortens said first line and lengthens the second line by an equal amount to move the structure towards said first point, and reverse operation of the drive means causes the structure to move towards the second point, the tension in both lines thus being always maintained to prevent displacement in either direction of the structure from said desired position.

The mechanism can conveniently be incorporated within the upstanding frame of the casing stabbing tool according to the invention in which case the first line is secured to the casing spider and the second line to an anchorage point on the rig. Preferably the drive means is a pneumatic or hydraulic cylinder which can be operated from the rig's supply.

An embodiment of each aspect of the present invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings in which:-

Figure 1 is an elevation of a casing stabbing tool according to a first aspect of the invention;

Figure 2 is a section on the line A-A in Fig. 1;

Figure 3 is a section on the line B-B of Fig. 1;

Figure 4 is a partial elevation of a modification of the tool of Figs. 1 to 3 according to the second aspect of the invention;

Figure 5 is a section on the line C-C of Fig. 4;

Figure 6 is a front elevation of a drive mechanism according to the third aspect of the invention;

Figure 7 is a section along the line A-A of Fig. 6;

Figure 8 is a section on the line B-B of Fig. 7; and

Figure 9 is an end elevation taken on the left-hand end of Fig. 7.

As shown in Figs. 1 to 3 a casing stabbing tool 10 comprises a mast 12 having projecting laterally therefrom a first lower clamping assembly 14, a second lower clamping assembly 16, a first upper clamping assembly 18 and a second upper clamping assembly 20 having a lifting becket 21 secured thereto.

Each lower clamping assembly 14, 16 comprises a platform 22, the lower platform being braced by a strut 24 and the upper by a strut 26. Each platform 22 has a mouth 28 for receiving a downhole casing joint 30 and which is provided with two arcuate abutment plates 32. Mounted on each platform 22 is a pneumatic ram 34 linked to two claws 36, 37 having arcuate linings 38 and capable of operating each independently to clamp the joint 30 securely against the plates 32.

Each upper clamping assembly 18, 20 is braced by a strut 39 and has a mouth 40 provided at the rear thereof with a narrow, semi-cylindrical collar 42. Pivotally mounted claws 44, 46 are independently operable by a pneumatic ram 48, these units being slightly smaller than the corresponding units on the lower platforms, to embrace an upper casing joint 50 to be added to the string.

In use the tool 10 is suspended from a derrick by a wire tugger line attached to the becket 21.

To instal the new joint 50 the rams 34 are actuated to close the two pairs of claws 36, 37 firmly around the joint 30 which is itself firmly embraced by a spider so as to clamp the whole tool 10 thereto. The upper joint 50 is then swung into position by the rig's lifting mechanism until its threaded frusto-conical lower end 52 is a short distance above the internally threaded collar 54 on the joint 30. With the joint 50 thus suspended the rams 48 are operated to close both sets of claws 44, 46 around the joint 50, bringing it into exact axial alignment with the joint 30 but still permitting axial and rotational movement thereof, so that it may thereafter be lowered or stabbed until the frusto-conical end 52 engages the mouth of the collar 54 and be subsequently rotated in the conventional manner until the threaded connection between the joints 30, 50 is fully made up.

The modified tool 60 shown in Figs. 4 and 5 generally resembles the tool 10 except that the fixed upper clamping assembly 18 is replaced by a moveable assembly 62 and the tapered mast 12 by a mast 64 of constant cross-section.

The platform 22 of the assembly 62 is mounted on a sleeve 66 slidably received on the mast 64 and is moveable in a

vertical direction by a pneumatic cylinder 86, supplied by an air-over-oil reservoir (not shown) and controlled by a pressure regulator (not shown). The platform mouth 40 has two arcuate plates 70 upstanding from the rear thereof and bears pivotally-mounted claws 72, 74, each provided with arcuate plates 76 and operable by a ram 78; each of the four plates 70, 76 has two vertically disposed rubber rollers 80 mounted thereon.

In an unillustrated alternative, the ram 78 may be replaced by a ram mounted along the length of the platform 22 (i.e. at right angles to the ram 78) and having a piston rod running in a guide frame to take lateral forces, the rod being pivotally connected to the ends of two push rods which are in turn pivotally connected at their other ends to the respective ends of the claws 72, 74. An adjustable stop in the form of a tapered pin is provided for the piston rod.

The tool 60 is operated in generally the same way as the tool 10 except that when all the clamping assemblies 14, 16, 62, 20 are engaged with the respective casing joints 30, 50 the new joint 50 is held suspended co-axially above the lower joint 30 by the frictional action of the rollers 80. The joint 50 is then lowered gently by operating the pressure regulator to reduce the pressure to slightly less than that required to support its weight and in this way only a very small proportion of the total load is borne by the threads during stabbing and subsequent rotation (which is allowed by the rollers 80) to make up the threaded connection.

If desired, the claws and moveable platform may be operated hydraulically instead of pneumatically.

In further modifications the mast 12, 64 may be cut above the clamping assembly 18 or 62 and each end fitted with flanges that may be bolted together for convenience of transportation; a lifting bracket not shown may be provided on the top of the mast 12, 64; the plates 32, linings 38 and collars 42 may be made interchangeable by means of aligned apertures and a locking pin with other, different-sized members to match the size of casing used; and the mouths 28, 40 may be made to accept guides to receive smaller sizes of casing.

A drive mechanism 110 as shown in Figs. 6 to 9 is housed largely within the lower part of a mast 112 of a casing stabbing tool and comprises a lower pulley housing 114 which is bolted to the flanged base of the mast 112 and houses a forward lead sheave 116 and a coaxial aft lead sheave 118.

Located at the bottom of the mast 112 and mounted on the housing 114 is a pneumatic cylinder 120 in which is received for reciprocation a piston (not shown) and piston rod 122 which can be moved upwardly by compressed air admitted through line 124 and downwardly by compressed air admitted through line 126.

On the upper end of the cylinder 120 is mounted an upper pulley housing 128 which includes two upright channel-section members 130 between the upper ends of which is mounted an offset fixed sheave 132. Opposed guide rails 134 are mounted between the lower portions of the members 130 and receive the respective ends of spindles 138, 140 carried in a travelling pulley block 142 and solid with respective upper and lower travelling sheaves 144, 146 each fitted with a retainer 148.

A forward wire cable 150 extends from an anchorage point 152 on the cylinder 120, round the lower travelling sheave 146 down to the forward lead sheave 116 and out through an aperture in the housing 114 to the casing spider (not shown).

An aft wire cable 154 extends downwardly from an anchorage point 156 at the top of the upper housing 130 around the upper travelling sheave 144, upwardly and around the fixed sheave 132, down to the aft lead sheave 118 and out through an aperture in the rear of the housing 114 to an anchorage point (not shown) on the rig.

When compressed air is admitted to the cylinder 120 through the line 124 the piston rod 122 is extended upwardly carrying with it the travelling block 142. The forward cable 150 is pulled in by an amount equivalent to twice the length of the stroke, thus pulling the whole mast 112 forward. This forward movement is permitted by the simultaneous paying out of an equivalent length of the cable 154 by virtue of the upward movement of the travelling sheave 144. As both the cables 150 and 154 remain under tension the bottom of the mast 112 is located in the desired position between the forward and aft anchorage points and restrained from swinging about.

Claims:

1. A casing stabbing tool (10) for facilitating screwing onto the upper threaded end (54) of the uppermost downhole joint (30) of a casing string the lower threaded end (52) of a next joint (50) to be added to the string, the tool (10) comprising an upstanding frame (12) having mounted thereon lower clamping means (14,16) for rigidly clamping the tool to the downhole joint (30) and upper clamping means (18) for embracing said next joint (50) adjacent the lower end (52) thereof, characterised in that the tool additionally comprises further clamping means (20) for embracing said next joint (50) at a higher point along the length thereof, the upper clamping means (20) being operable to ensure alignment of said next joint (50) when suspended above said downhole joint (30) but permitting axial and rotational movement of said next joint (50) so that it may be lowered and rotated to make up the threaded connection between the two joints (30,50).

2. A casing stabbing tool (60) for facilitating screwing onto the upper threaded end (54) of the uppermost downhole joint (30) of a casing string the lower threaded end (52) of a next joint to be added to the string, the tool (60) comprising an upstanding frame (64) having mounted thereon lower clamping means (14,16) for rigidly clamping the tool (60) to the downhole joint (30), and upper clamping means (62) for engaging said next joint (50), characterised in that the upper clamping means (62) are arranged to permit only relative rotational movement of said next joint (50), and in that the tool (60) additionally comprises actuating means (68) for moving said upper clamping means (62) axially with respect to said lower clamping means (14,16), whereby said next joint (50) may be partly or completely supported during stabbing and make-up.

3. A tool as claimed in claim 2, in which the upper clamping means (62) comprise a number of circumferentially arranged rollers (80) having a surface with a high co-efficient of friction.

4. A tool as claimed in claim 2 or 3 and additionally comprising upper clamping means (20) for ensuring alignment of the upper joint (50) while permitting relative axial and rotational movement thereof.

5. A tool as claimed in any preceding claim, in which each clamping means includes two pivotally mounted claws (36,37;44,46;72,74) directly or indirectly by actuating means (34,48,78).

6. A drive mechanism for positioning a structure (112) at a desired position between first and second points, the mechanism (110) comprising a pulley housing (114) having first and second lead sheaves (116,118) and a fixed sheave (132) mounted thereon, situated between said lead sheaves and fixed sheaves a travelling block (142) having first and second sheaves (144,146) and being arranged for reciprocal movement relatively to the housing (114), drive means (120,122) for imparting said movement to the travelling block (142), a first line (150) having one end secured to said housing (114) and running over the first sheave (141) on the travelling block (142) and the first lead sheave (116) to an anchorage at or beyond said first point, and a second line (154) secured to said housing (114) and running round the second travelling sheave (144) and the fixed turning sheave (132) and over said second lead sheave (118) to an anchorage at or beyond said second point, the arrangement being such that operation of the drive means (120,122) to move the

travelling block (142) away from said lead sheaves (116,118) and towards the fixed block (132) effectively shortens said first line (150) and lengthens the second line (154) by an equal amount to move the structure (112) towards said first point, and reverse operation of the drive means (120,122)moves the structure (112) in a corresponding manner towards the second point, the tension in both lines (150,154) thus being always maintained to prevent displacement of the structure (112) in either direction from said desired position.

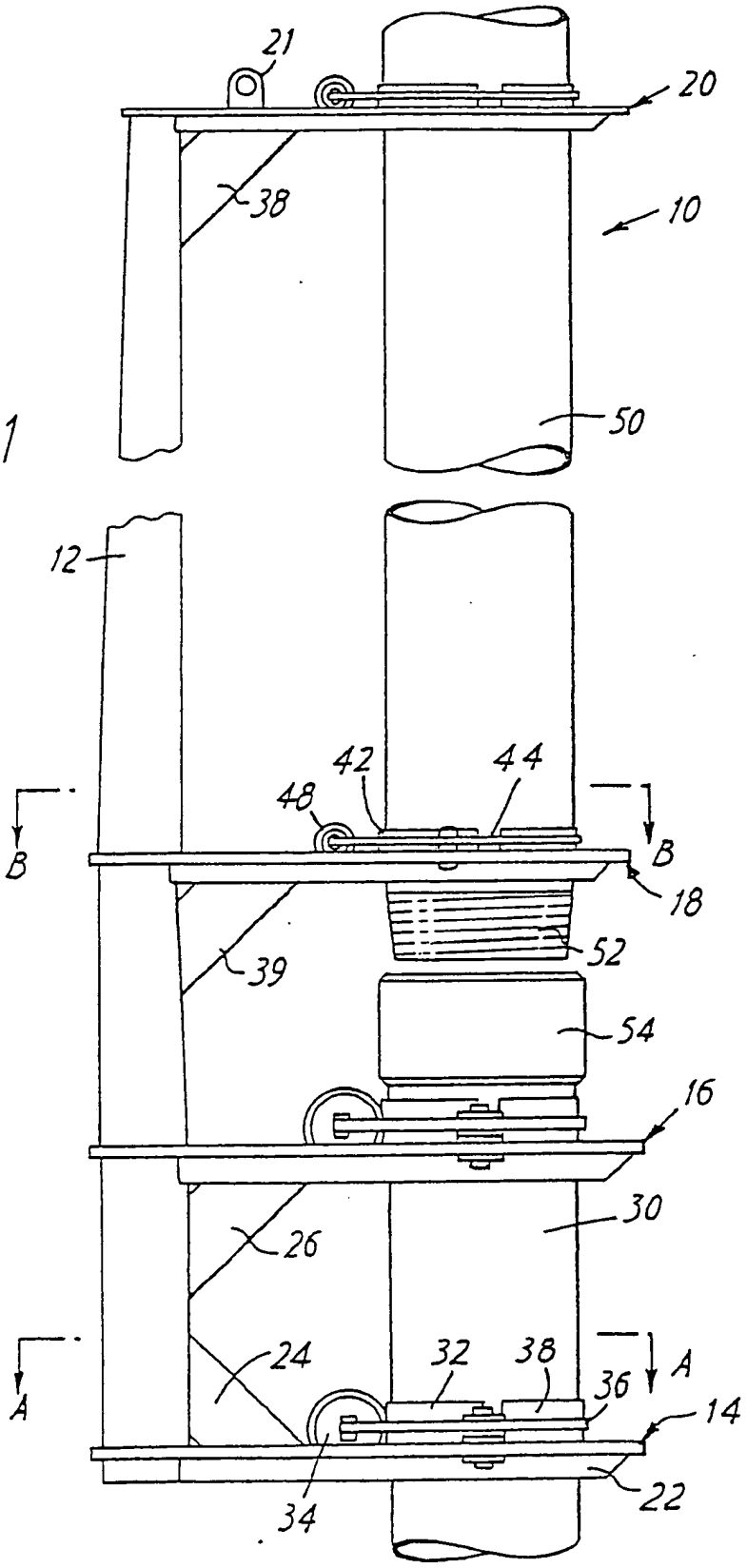
7. A mechanism as claimed in claim 6, in which the drive means comprises a pneumatically or hydraulically operated cylinder (120) and piston (122).

8. A mechanism as claimed in claim 6 or 7, in which the housing is constituted by a first housing (114) extending from one end of the drive means (120) in which the lead sheaves (116,118) are mounted and a second housing (128) extending from the opposite end of the drive means (120) in which the fixed sheave (132) is mounted.

9. A mechanism as claimed in claim 8, in which the travelling block (142) is mounted for reciprocation along a path (134) extending within the second housing (128).

10. A casing stabbing tool incorporating a mechanism as claimed in any one of claims 6 to 9.

FIG. 1



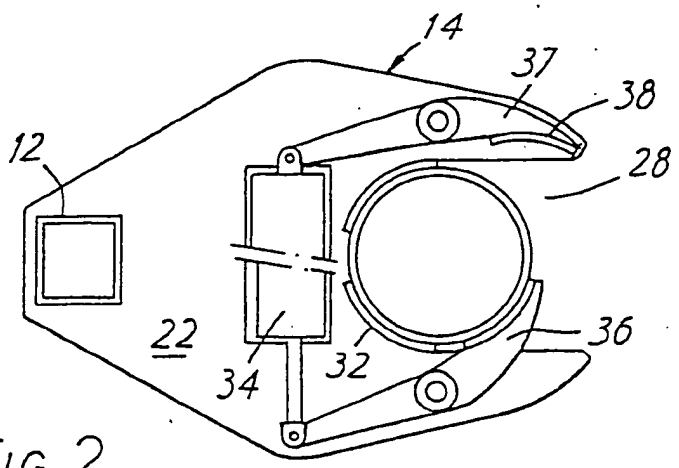


FIG. 2

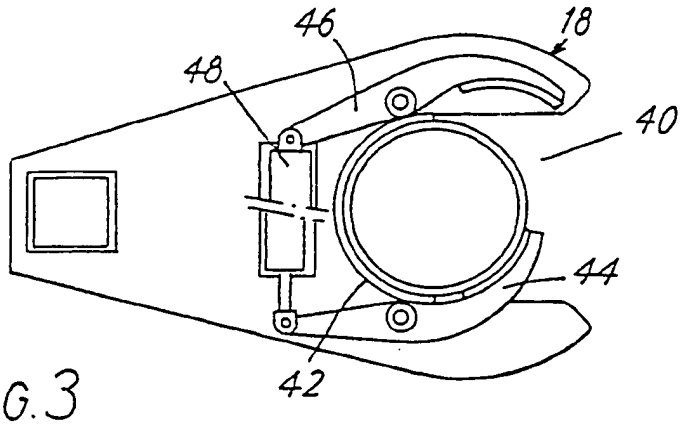


FIG. 3

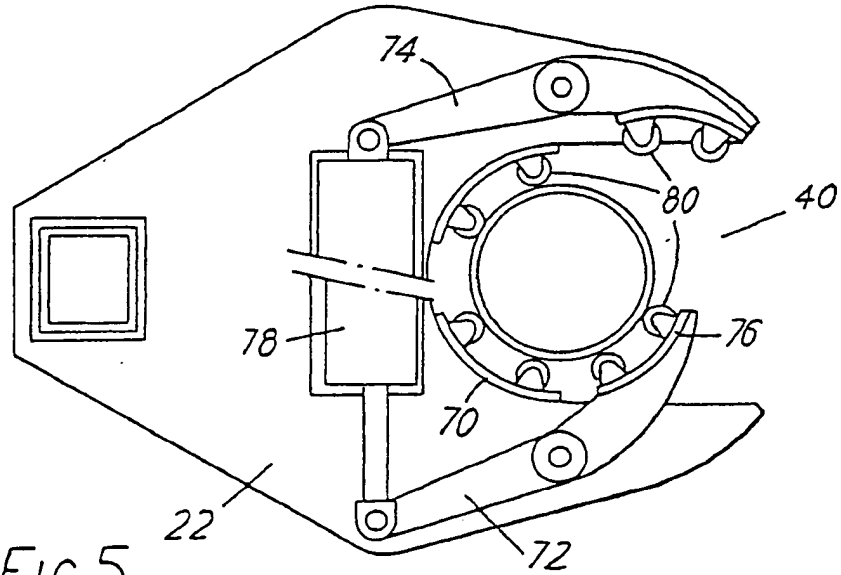


FIG. 5

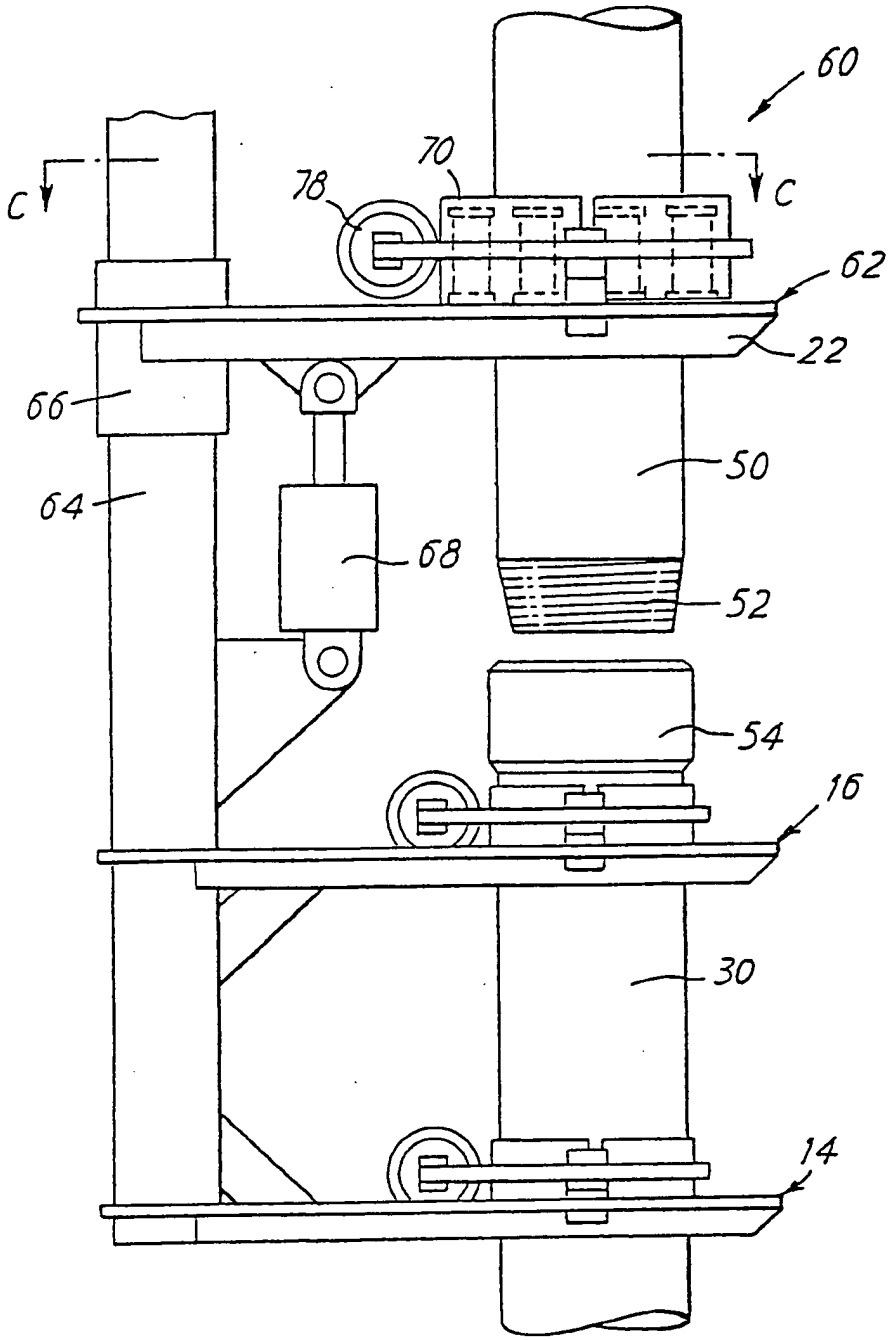


FIG.4

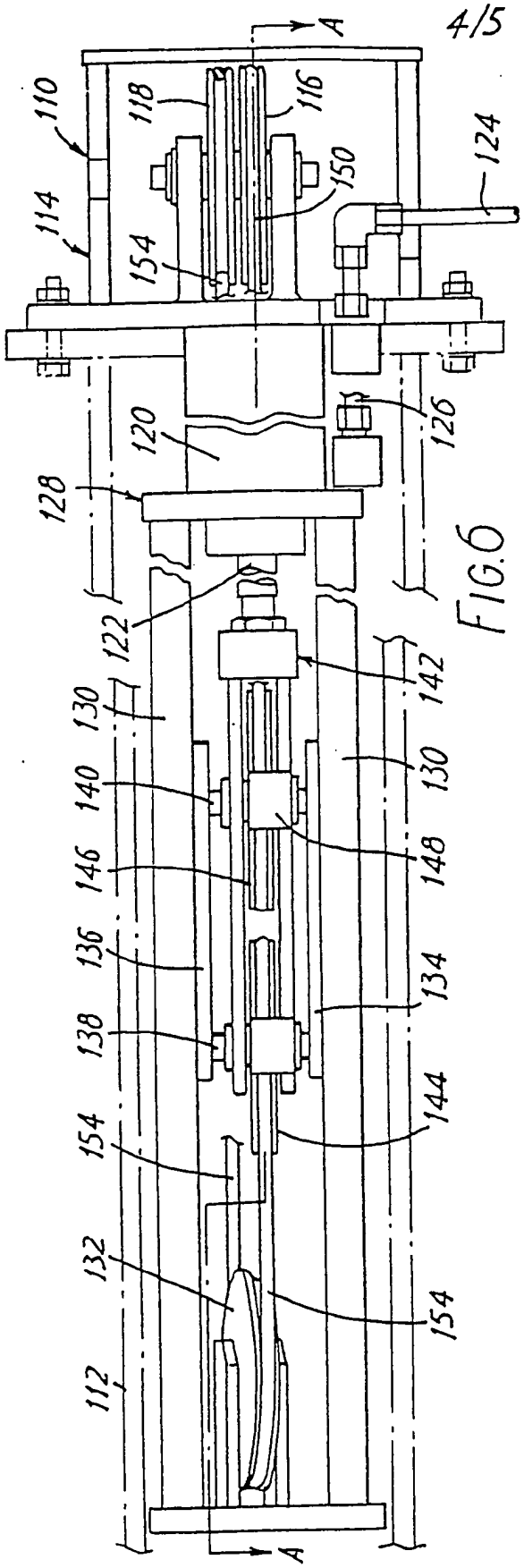


FIG.6

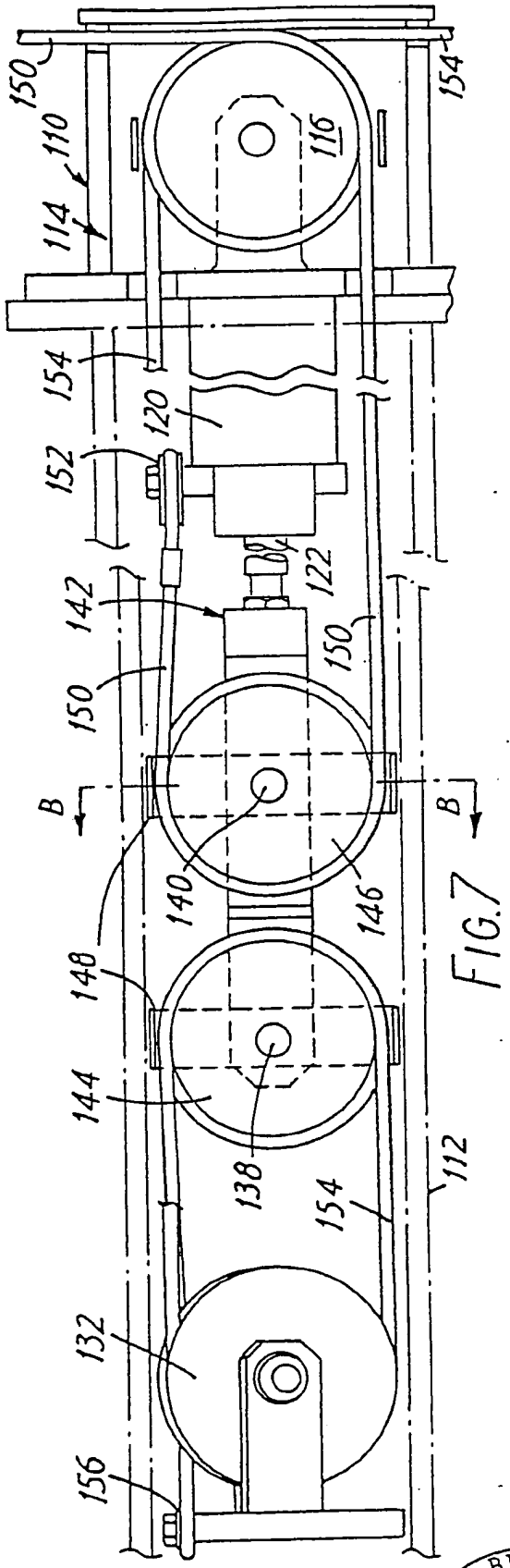


FIG.7

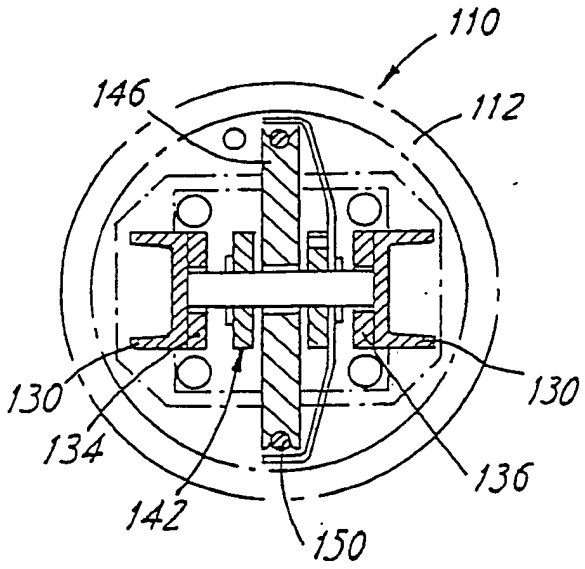


FIG.8

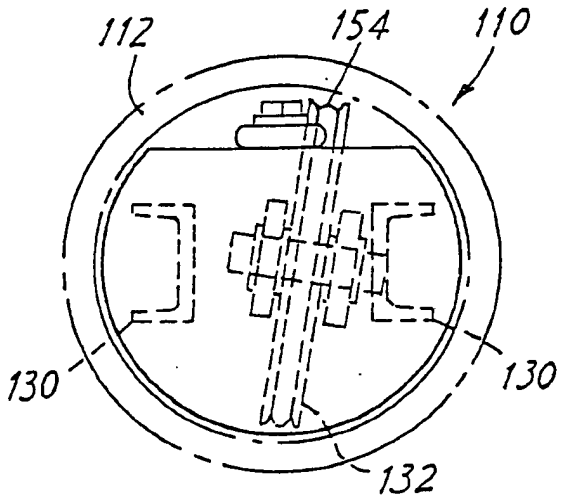


FIG.9

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 83/00097

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[3]: E 21 B 19/16

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC[3]	E 21 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A, 2450934 (I.X. CALHOUN) 12 October 1948 see column 2, line 8 - column 6, line 56; figures 1-8	1-5
A	US, A, 3659655 (L. OYONGYOSI) 2 May 1972 see column 2, line 11 - column 4, line 34; figure	6-9
A	US, A, 4092881 (R. JÜRGENS) 6 June 1978	
A	US, A, 4295527 (R.A. RÜSSE) 20 October 1981 (cited in the application)	

* Special categories of cited documents: [15]

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
4th July 1983	18 JUL 1983
International Searching Authority [1]	**Signature of Authorized Officer [20]**
EUROPEAN PATENT OFFICE	G.L.M. Kruydenberg

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 83/00097 (SA 4971)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/07/83

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 2450934		None	
US-A- 3659655	02/05/72	None	
US-A- 4092881	06/06/78	None	
US-A- 4295527	20/10/81	DE-A- 2815705	25/10/79